

REMARKS/ARGUMENTS

Reconsideration of this application in light of the above amendments and following comments is courteously solicited.

The invention as claimed in amended claim 1 is directed to a metal/ceramic bonding substrate comprising: a ceramic substrate; a metal circuit plate bonded to one side of said ceramic substrate; a heat sink member of a metal, one side of which is bonded to the other side of said ceramic substrate; and a work-hardened layer of the same material as said metal, formed on the other side of said heat sink member.

Thus, according to the invention as claimed in claim 1, it is possible to provide a metal/ceramic bonding substrate capable of preventing the reverse thereof from greatly warping so as to be concave even if it is heated for soldering.

In a preferred embodiment of a metal/ceramic bonding substrate according to the present invention, a work-hardened layer is formed on a heat sink plate by shot peening. If ceramic or metal balls are caused to collide with a heat sink plate of a metal, such as aluminum or copper, a surface portion having a thickness of a few to hundreds micrometers is hardened by the peening effect, so that a work-hardened metal layer is formed. Therefore, the work-hardened layer is made of the same material as the metal which is the material of the heat sink plate.

If the layer hardened by the peening effect is arranged on the reverse of the heat sink plate, the extending amount of the reverse due to thermal expansion during heating for soldering is greater than the contracting amount of the reverse due to thermal contraction during cooling, so that the reverse of the heat sink plate can warp so as to be convex after heating.

Claims 1-7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Nagase et al. (USP6,033,787) in view of

Elmoursi et al. (US2003/0219576A1).

Nagase et al. disclose a metal/ceramic bonding substrate comprising: a ceramic substrate; a metal circuit plate bonded to one side of the ceramic substrate; a heat sink member bonded to the other side of the ceramic substrate. However, Nagase et al. fail to suggest or disclose that a work-hardened layer of the same material as a metal which is the material of the heat sink member is formed on the heat sink member. Therefore, Nagase et al. fail to suggest or disclose any metal/ceramic bonding substrate capable of preventing the reverse thereof from greatly warping so as to be concave even if it is heated for soldering.

Elmoursi et al. disclose a copper-based circuit wherein a layer of copper particles 101 is formed on a silver bond layer 62 formed upon a substrate 60 of alumina, aluminum nitride or the like. However, the bond layer 62 is formed for facilitating the deposition of the copper particles 101 upon the substrate 60 (see paragraph 0028), and the material of the bond layer 62 is different from that of the layer of the copper particles 101. Thus, Elmoursi et al. fail to suggest or disclose that a work-hardened layer of the same material as a metal which is the material of the heat sink member is formed on the heat sink member. Therefore, Elmoursi et al. fail to suggest or disclose any metal/ceramic bonding substrate capable of preventing the reverse thereof from greatly warping so as to be concave even if it is heated for soldering.

Accordingly, it is believed that the amended claims patentably distinguish the invention from the prior art.

An earnest and thorough attempt has been made by the undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding issues which remain in

this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims as amended herein patentably define over the art relied on by the Examiner and early allowance of same is courteously solicited.

If any fees are required in connection with this case, it is respectfully requested that they be charged to Deposit Account No. 02-0184.

Respectfully submitted,

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I, Rachel Piscitelli, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on May 2, 2006.

